

ABSTRACT OF THE DISCLOSURE

5 A regularization model for electrical resistance mapping of a combustion vessel such as, for example, a furnace 12 which combusts a fossil fuel, stabilizes the calculation of resistivities ρ from measured voltages u by incorporating third level and/or second level error minimization terms into the model. The third level error minimization term represents a third difference of resistivity $\nabla_x^3 \rho_x$. The second level error minimization term represents a second difference of resistivity $\nabla_x^2 \rho_x$. The third level and
10 second level error minimization terms are deliberately defined to approximate local parabolic and linear behavior. A regularization constant γ is used to adjust the weight afforded the third level and/or second level error minimization terms. A system computer 62 uses numerical methods to solve the regularization model for values of resistivity ρ that result in a pre-
15 established acceptable level of error E . The regularization model is incorporated into an on-line combustion vessel monitoring system.